

5/c

Notice of Allowability

Application No.

10/721,126

Examiner

Stephen W. Smoot

Applicant(s)

HUANG ET AL.

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to applicant's amendment filed on 29 November 2005.
2. ☒ The allowed claim(s) is/are 23-41.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

Stephen W. Smoot

Stephen W. Smoot
Patent Examiner
Art Unit 2813

DETAILED ACTION

This Office action is in response to applicant's amendment filed on 29 November 2005.

Drawings

1. Replacement drawing sheets corresponding to Figs. 1, 2 and to Figs. 27, 28 were received on 29 November 2005. These drawings are acceptable.

Allowable Subject Matter

2. Claims 23-41 are allowed.
3. The following is an examiner's statement of reasons for allowance:
 - Claims 23-27 are allowed because the prior art of record does not teach or suggest, in combination with the other claim limitations, a method of forming a via and a trench through dielectric material that avoids effects due to misalignment that includes the steps of forming a mask layer over the dielectric material,

forming a via in the mask layer to a first predetermined depth by etching, and forming a trench in the mask layer to a second predetermined depth by etching, wherein the mask layer comprises at least two pairs of mask films, wherein the second predetermined depth is less than the first predetermined depth, and wherein the dielectric material is not exposed until after the step of removing any material from the via that may remain as a consequence of misalignment between the trench and the via;

- Claims 28-39 are allowed because the prior art of record does not teach or suggest, in combination with the other claim limitations, a method of forming a via and a trench through dielectric material that avoids effects due to misalignment that includes forming in sequence first, second, third, and fourth mask films over the dielectric material, forming a via to a first predetermined depth by etching the second, third, and fourth mask films, and forming a trench to a second predetermined depth by etching at least the fourth mask film, wherein the second predetermined depth is less than the first predetermined depth, and wherein the dielectric material is not exposed until after the step of removing any material from the via that may remain as a consequence of misalignment between the trench and the via; and
- Claims 40-41 are allowed because the prior art of record does not teach or suggest, in combination with the other claim limitations, a semiconductor device having a dielectric material deposited over an underlying interconnect layer that includes first, second, third, and fourth mask films formed in sequence over the

dielectric material, a via formed to a first predetermined depth by etching at least some of the mask films, and a trench formed to a second predetermined depth by etching at least some of the mask films, wherein the first and third mask films have substantially identical etch properties and the second and fourth mask films have substantially identical etch properties, wherein the second predetermined depth is less than the first predetermined depth, and wherein any material remaining in the via as a consequence of misalignment can be removed prior to exposing the dielectric material.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen W. Smoot whose telephone number is 571-272-1698. The examiner can normally be reached on M-F (8:00 am to 4:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SWS